What is claimed is:

1. An electrical system for regulating electrical current flowing from a power source to a load, the electrical system comprising:

(a) a current pass regulator element connectable to the power source to control supply current drawn from the power source,

(b) a primary voltage multiplying finite output resistance circuit having an input connected to the current pass regulator element and an output connectable to the load, and having a user settable regulated current determining element for determining magnitude of regulated current to flow to the load,

(c) a model voltage multiplying finite output resistance circuit including an input connected to the current pass regulator element and an output supplying a model current Imodel,

(d) a current sense circuit connected to force an output voltage of the model voltage multiplying finite output resistance circuit to be equal to an output voltage of the primary voltage multiplying finite output resistance circuit,

(e) a constant current source for sinking a reference current Iref, and

(f) a control circuit responsive to the current sense circuit and the constant current source and connected to control the current pass regulator element to force the model current Imodel to be equal to the reference current Iref, such that current passing through the primary voltage multiplying finite output resistance circuit is regulated at a level established by the user settable current determining element irrespective of input voltage variation of the power source.

2. The electrical system set forth in claim 1 including a non-overlapping two phase clock generator and wherein the primary voltage multiplying finite output resistance circuit comprises a first charge pump clocked by the clock generator and wherein the user settable regulated current determining element comprises a flying capacitor having a capacitance value selected by the user to establish regulated output current level.

3. The electrical system set forth in claim 2 wherein the model voltage multiplying finite output resistance circuit comprises a second charge pump clocked in synchronism with the first charge pump.

4. The electrical system set forth in claim 3 wherein the current sense circuit comprises a voltage comparison circuit having a first input connected to monitor output voltage of the primary voltage multiplying finite output resistance circuit, having a second input connected to monitor output voltage of the model voltage multiplying finite output resistance circuit, and having a voltage comparison output; and, a model current regulator responsive to the voltage comparison output and connected to force the output voltage of the model voltage multiplying finite output resistance circuit to be equal to the output voltage of the primary voltage multiplying finite output resistance circuit.

5. The electrical system set forth in claim 4 wherein the model current regulator of the current sense circuit is connected in series with the constant current source, and wherein the control circuit comprises a current controlled source having an input connection to a node between the model current regulator and the constant current source for sourcing and sinking current to maintain model current Imodel equal to reference current Iref and having an output connected to control current passing through the current pass regulator element.

6. The electrical system set forth in claim 5 wherein the current pass regulator element comprises a voltage controlled current regulator, and wherein the current controlled source comprises a current controlled voltage source for outputting a voltage control.

7. The electrical system set forth in claim 4 wherein the model current regulator comprises a metal oxide semiconductor field effect transistor.

8. The electrical system set forth in claim 6 wherein the voltage controlled current regulator comprises a metal oxide semiconductor field effect transistor.

9. The electrical system set forth in claim 1 formed as a monolithic integrated circuit chip without the user settable regulated current determining element and having external connections to the power source, load and user settable regulated current determining element.

10. The electrical system set forth in claim 9 having an additional external connection to an enable signal.

11. The electrical system set forth in claim 9 contained in a six-pin integrated circuit package comprising a power source pin, a ground return pin, a load pin, an enable pin, and two pins for connecting the user settable regulated current determining element.

12. The electrical system set forth in claim 11 wherein the package conforms to an industry-standard SOT-23 package convention.

13. The electrical system set forth in claim 1 wherein the power source comprises a battery and the load comprises at least one light emitting diode.

14. An integrated circuit formed in accordance with a complementary metal oxide silicon process for regulating electrical current flowing from a battery power source to a load without requiring an external current sense resistor, the integrated circuit comprising:

(a) a current pass regulator element connectable to the battery power source to control supply current drawn from the power source,

(b) a primary charge pump having an input connected to the current pass regulator element and an output connectable to the load, and having pin connections to an external flying capacitor, the value of the external flying capacitor selected to fix magnitude of regulated current to flow to the load,

(c) a model charge pump having an input connected to the current pass regulator element and a model output supplying a model current Imodel, and including a current sense circuit, and a constant current source for sinking a reference current Iref, wherein the current sense circuit is connected and functions to compare voltage levels at the outputs of the primary and model charge pumps and to force voltage level at the output of the model charge pump to be equal to a voltage level at the output of the primary charge pump, and

(d) a control circuit having a current sourcing/sinking input connected to a node between the current sense circuit and the constant current source and having a control output connected to control the current pass regulator element to force the current Imodel to be equal to the reference current Iref, such that current passing

through the primary charge pump is regulated at a level established by the capacitance value of the flying capacitor irrespective of voltage variation of the battery power source.

15. The integrated circuit set forth in claim 14 wherein the current pass regulator element comprises a voltage controlled current regulator, and wherein the control circuit comprises a current controlled voltage source for outputting a voltage control to control the voltage controlled current regulator.

16. The integrated circuit set forth in claim 14 contained in a six-pin integrated circuit package including a power source pin, a ground return pin, a load pin, an enable pin, and two pins for connecting the external flying capacitor.

17. The integrated circuit set forth in claim 15 wherein the package conforms to an industry-standard SOT-23 package convention.

18. The integrated circuit set forth in claim 14 wherein the load comprises at least one light emitting diode.

19. A method for regulating current flowing from a battery to a load without directly sensing current flow at the load, comprising the steps of:

(a) passing current from the battery through a current pass regulator element,

(b) providing current from the current pass regulator element to a primary voltage multiplying finite output resistance circuit providing regulated current flow to the load,

(c) selecting a value for a user settable output resistance determining element of the primary voltage multiplying finite output resistance circuit in order to determine magnitude of regulated current to flow to the load,

(d) providing current from the current pass regulator element to a model voltage multiplying finite output resistance circuit in order to generate a model current Imodel,

(e) passing the model current through a current sense circuit, and into a constant current source for sinking a reference current Iref,

(f) controlling the current sense circuit to force a voltage level at the output of the model voltage multiplying finite output resistance circuit to be equal to a voltage level at the output of the primary voltage multiplying finite output resistance circuit, and,

(g) controlling the current pass regulator element to force the current Imodel to be equal to the reference current Iref, such that current passing through the primary voltage multiplying finite output resistance circuit is regulated at a level established by the user settable current determining element irrespective of input voltage variation of the power source.

20. The method set forth in claim 19 wherein the step of providing current from the current pass regulator element to a primary voltage multiplying finite output resistance circuit comprises providing current to a primary charge pump, wherein the step of providing current from the current pass regulator element to a model voltage multiplying finite output resistance circuit comprises providing current to a model charge pump, and wherein the step of selecting a value for a user settable output resistance determining element comprises selecting a capacitance value of an external flying capacitor in order to determine magnitude of regulated current flow to the load.

21. The method set forth in claim 19 for regulating current flowing to a load comprising at least one light emitting diode.